PEI-18H Polyethylenimine

1. Product Overview

Polyethylenimine (PEI), also known as polyaziridine, is a water-soluble polymer with the highest cationic density. Its basic structure consists of repeating units of two carbon atoms and one nitrogen atom, with the molecular formula $(CH_2CH_2NH)_n$.

SIOResin® PEI-18H is a medium-to-low molecular weight grade in the SIOResin PEI product series (molecular weight: 1,800). It appears as a colorless or pale yellow viscous liquid with a slight ammonia odor. PEI-18H contains abundant primary ($-NH_2$), secondary (-NH-), and tertiary (-N<) amine groups, combining polar (amine) and hydrophobic (vinyl) structures. It can react with hydroxyl, carboxyl, carbonyl, and other functional groups via hydrogen bonding, ionic bonding, or covalent bonding, endowing it with excellent adhesion, cationicity, and reactivity. It is suitable for applications in coatings/inks, textiles, antimicrobial preservation, and more.

2. Key Properties

1. **High Adhesion & Adsorption**: The polar amine groups in PEI-18H can bond with hydroxyl (hydrogen bonds), carboxyl (ionic bonds), carbonyl (covalent bonds), and other groups, enhancing adhesion to polar materials (e.g., paper, films, fibers). Ideal for scenarios requiring improved adhesion strength (e.g., coating thickening, ink fixation).
2. **Moderate Cationicity**: Exists as a polymeric cation in water, neutralizing/adsorbing anionic substances and aiding in dispersing or stabilizing particles (e.g., pigments, ceramic powders). However, its cationic density is lower than high-molecular-weight grades (e.g., PEI-70K), making it suitable for applications with moderate cationic strength requirements.
3. **High Reactivity**: Rich in primary/secondary amine groups, it readily reacts with epoxides, aldehydes, isocyanates, etc., enabling use in coating crosslinking modification, aldehyde adsorption, or functional finishing (e.g., flame retardant fixation).
4. **Fast Drying & Water Resistance (Coatings/Inks)**: In acrylic emulsion systems, it significantly enhances coating drying speed and water resistance, improving film formation performance.

3. Physical Parameters

Property	PEI-18H Specification
Molecular Weight	1,800
Viscosity (mPa·s)	8,000 – 20,000
Resin Content	> 99%
Amine Value	19
Decomposition Temperature	300 °C
Flash Point	260 °C
Appearance	Colorless or pale yellow liquid
pH (5% aqueous solution)	10–12

Property	PEI-18H Specification
Specific Gravity	1.04

4. Application Scope

Based on its properties, PEI-18H is mainly used in the following fields:

Field	Specific Application	Key Function
Coatings & Inks	Acrylic emulsion-based coatings	Acts as a fast-drying agent and thickener, improving coating drying speed and water resistance.
	Functional inks (e.g., alcohol-based inks for films, auxiliary use)	Enhances ink adhesion to substrates when combined with resins (e.g., polyvinyl butyral).
Textiles & Fibers	Flame retardant fixation (phosphorus-based)	Serves as a flame retardant retention agent, improving durability of phosphorus-based flame retardants in fibers.
	Glass fiber sizing agent	Imparts lubricity to glass fibers, reducing friction during processing.
Dispersants	Dispersion of ceramics, carbon black, pigments, etc.	Stabilizes dispersion of ceramic powders, carbon black, metal powders, etc., preventing agglomeration and enhancing uniform adhesion to substrates.
Antimicrobial Preservation	Wood preservatives, cut flower preservatives (Ag/Cu composite)	Forms chelates with Ag/Cu; leverages PEI's high permeability to enhance penetration depth and metal ion retention of antimicrobial agents.

5. Storage & Handling Precautions

5.1 Storage Stability Management

- **Recommended Conditions**: Low temperature (<25°C; long-term storage recommended at 4–10°C refrigeration), light-proof, dry, and sealed environment.
- **High-Temperature Risk**: Storage above 80°C or exposure to air may cause oxidation, discoloration (darkening), surface skinning, severely degrading performance (e.g., reduced amine value, weakened viscosity).
- **Hygroscopicity**: PEI-18H is hygroscopic and absorbs CO_2; containers must be tightly sealed to avoid contact with moist air (otherwise, salts may precipitate or the product may fail).

5.2 Material Compatibility

- **Recommended Materials**: Stainless steel, polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC) (corrosion-resistant, non-reactive with PEI).
- **Prohibited Materials**: Soft iron/iron (triggers oxidation, causing solution discoloration and hardening); copper/brass alloys (reacts to form green compounds, contaminating the product).

5.3 Handling Notes

- Ensure containers are sealed before use to avoid contamination (e.g., water, dust); reseal immediately after use to minimize air exposure.
- For dilution or formulation, use deionized water or weakly polar solvents (e.g., ethanol); avoid strong acid/alkali environments (may damage amine group structures).

5.4 Long-Term Storage Recommendations

- Store in a cool, light-proof warehouse with non-permeable flooring (to prevent leakage/contamination); avoid direct sunlight or rain exposure.
- Regularly inspect packaging (e.g., drums/bottles) for integrity. If swelling, leakage, or abnormal odor (stronger ammonia smell) occurs, discontinue use and contact the supplier.